## Claims

1. A device for measuring an optical break-through which is created in a tissue (6, 14), beneath a tissue surface, by treating laser radiation (2) which a laser surgical unit (1) focuses into a treatment focus (11), said focus being located in the tissue (6, 14), wherein said device has a detection beam path comprising optics, wherein the optics couple radiation emitted by the tissue (6, 14), from beneath the tissue surface, into the detection beam path, and a detector unit (4, 3, 9; 39, 40, 41; 58, 59, 60) is arranged following the detection beam path, said detector unit (4, 3, 9; 39, 40, 41; 58, 59, 60) generating a detection signal which indicates the spatial extent and/or position of the optical break-through in the tissue (6, 14).

2. The device as claimed in Claim 1, characterized by an illumination radiation source (5, 29, 53), which couples illumination radiation into the tissue (14).

3. The device as claimed in Claim 2, wherein the source of illumination radiation is also provided for emission of the treating laser radiation (2).

4. The device as claimed in Claim 2 or 3, wherein the source of illumination radiation (5) and the detection beam path are part of an interferometer structure (3).

5. The device as claimed in Claim 4, wherein the interferometer structure (3) comprises a measuring arm and an adjustable reference arm (7, 8), with the illumination radiation having a coherence length, in the direction of light propagation on which the resolution at which the detection signal indicates the spatial extent depends, wherein interference appears only, if the lengths of the measuring arm and of the reference arm differ by no more than the coherence length.

6. The device as claimed in Claim 4 or 5, wherein the source of illumination radiation focuses the illumination radiation (12) into an illumination focus (11) located in the tissue (14), wherein the position of the illumination focus (11) is adjustable so as to generate the detection signal.

7. The device as claimed in Claim 6, wherein the illumination radiation is coupled into a light path of the treating laser radiation, wherein adjustable optics (26) are provided by which the divergence of the illumination radiation is changeable without changing the divergence of the treating laser radiation.

8. The device as claimed in Claim 1, 2 or 3, wherein the detector unit (39, 40, 41) detects the radiation emitted by the tissue by means of confocal imaging.

9. The device as claimed in Claim 8, wherein the detector unit generates the detection signal by adjusting the focus of confocal imaging, preferably along a ray direction of the treating laser radiation.

10. The device as claimed in Claim 8 or 9, wherein the optics (39) of the detection beam path have certain light dispersing properties, so that they comprise different focal points (45, 46, 47) during confocal imaging for different spectral regions, wherein the detector unit effects a spectrally selective detection of the radiation recorded in confocal imaging, in order to generate the detection signal.

11. The device as claimed in Claim 10, characterized by a multi-channel spectrometer (51) for picking up radiation behind a pinhole.

12. The device as claimed in Claims 2 and 10, wherein the source of illumination radiation (30) comprises a plurality of partial radiation sources, which are individually operable and have different spectral properties, so that spectral selective sensing is obtained by sequentially operating said partial radiation sources.

13. The device as claimed in Claim 1, 2, or 3, wherein the detection beam path (67) has an optical axis (61) which is located obliquely to an optical axis (62, 60) of the treating laser radiation or of illumination radiation.

14. The device as claimed in Claims 13 and 2, wherein the source of illumination radiation (53) causes a slit illumination of the tissue (14).

15. The device as claimed in Claim 13 or 14, characterized by a scanning unit (54), by which the position of the optical axis (61) of the detection beam path (67) is adjustable relative to the optical axis (62, 60) of the treating laser radiation or of the illumination radiation.

16. The device as claimed in any one of the above Claims, wherein the detector unit determines a measure of the spatial extent and/or position of individual scattering centers, preferably the scattering centers in the cornea of an eye, which are generated by the break-through.

17. The device as claimed in any one of the above Claims, wherein the detection signal (5) indicates a diameter of a plasma bubble (11), which was generated by an optimal break-through.

18. The device as claimed in any one of the above Claims, characterized by a scanning device (21, 54) for scanning the tissue (14).

19. A method of measuring an optical break-through which is created in a tissue, beneath a tissue surface, by treating laser radiation, wherein radiation emitted by the tissue, from beneath the tissue surface, is detected and a measure of the spatial extent and/or position of the optical break-through is determined therefrom.

20. The method as claimed in Claim 19, wherein the spatial extent and/or position of scattering centers generated by the optical break-through is determined.

21. The method as claimed in Claim 19 or 20, wherein the observation radiation is irradiated into the tissue, and radiation emitted by the tissue in the form of back-reflection is evaluated.

22. The method as claimed in Claims 20 and 21, wherein the radiation emitted by the tissue is interferometrically detected.

23. The method as claimed in Claim 22, wherein the position of the radiation emitted by the tissue along an optical axis of detection is determined from the occurring interference.

24. The method as claimed in any one of Claims 19 to 21, wherein the radiation emitted by the tissue is detected by means of confocal imaging and the spatial extent is determined by adjusting a focus of said confocal imaging.

25. The method as claimed in Claim 24, wherein different spectral focal points are generated in confocal imaging by dispersive optics and radiation recorded behind a pinhole is spectrally evaluated.

26. The method as claimed in Claims 21 and 24, wherein spectrally different radiation is sequentially irradiated and the radiation emitted by the tissue is sequentially recorded.

27. The method as claimed in Claim 19, wherein the emitted radiation is detected along an optical axis which is oblique relative to an optical axis along which the treating laser radiation or observation radiation is irradiated into the tissue.

28. The method as claimed in Claim 27, wherein the treatment radiation is irradiated into the tissue in a slit-shaped manner.

29. The method as claimed in Claim 27 or 28, wherein the position between the optical axis of detection and the irradiation is adjusted in order to obtain information on the spatial extent of the interaction.

30. The method as claimed in any one of Claims 19 to 29, wherein a measure of the spatial extent of individual scattering centers generated by the optical break-through is generated.

31. The method as claimed in Claim 30, wherein a diameter of a plasma bubble is determined.

32. A method of measuring a transparent or semi-transparent tissue, wherein illumination laser radiation is focused in a focal point in the tissue and the position of the focal point within the tissue is changed, to which end a variable deflection of the illumination laser radiation is effected, wherein tissue-specific signals induced by said focusing are detected and are assigned to points of measurement whose location in the tissue is respectively defined by the specific position of the focal point, and in that points of measurement are filtered out, thus allowing to determine the position of boundaries and/or inclusions in the tissue.

33. The method as claimed in Claim 32, wherein target points for a subsequent treatment of the tissue by means of treating laser radiation focused in the tissue are determined by means of the filtered-out points of measurement.

34. The method as claimed in Claim 32, wherein the treating laser radiation is locally changed by means of the same optical means in the tissue, by means of which the position of the focal point of the illumination laser radiation is also changed.

35. The device as claimed in Claim 34, wherein for the illumination laser radiation, an illumination radiation source is used, which is also provided for emission of the treating laser radiation.

36. The method as claimed in any one of Claims 33 to 35, wherein points of measurement and target points are repeatedly determined, with treating laser radiation being respectively applied to the target points.

37. A device for measuring a transparent or semi-transparent tissue, comprising a source of laser radiation (1), a deflecting unit (2), a focusing unit (3) and a detector unit (8) as well as a control unit (9) which controls the source of laser radiation (1), the deflecting unit (2) and the focusing unit (3) such that illumination laser radiation emitted by the source of laser radiation (1) is sequentially focused into a plurality of focal points (MP) within the tissue (6) by the deflecting unit (2) and the focusing unit (3), wherein the detector unit (8) emits tissue-specific signals (S), which are induced by said focusing, to the control unit (9), and said control unit (9) assigns said signals (S) to points of measurement (MP) whose location in the tissue (6) is respectively defined by the position of the focal point, and filters out points of measurement (MP) and thus determines positions of boundaries and/or inclusions in the tissue (6).

38. The device as claimed in Claim 37, wherein, by means of the filtered-out points of measurement (MP'), the control unit (9) determines target points (ZP) for a subsequent treatment of the tissue (6) by means of focused treating laser radiation.

39. The device as claimed in Claim 38, wherein the treating laser radiation passes through the deflecting unit (2) and the focusing unit (3).

40. The device as claimed in any one of Claims 37 to 39, wherein the source of laser radiation (1) is provided for emission of the illumination laser radiation and of the treating laser radiation.

41. The device as claimed in Claim 40, characterized by an energy reducer (7), which is, at times, arranged following the source of laser radiation (1) in the beam path and emits said illumination laser radiation (10).